AzureWave Technologies, Inc.

AW-NM378SM

IEEE 802.11b/g/n Wi-Fi and Bluetooth 4.0 Combo Stamp LGA Module

Datasheet

Rev. D

DF

(For Standard)

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

Features

WLAN

- Single-band 2.4 GHz IEEE 802.11 b/g/n
- Single-stream IEEE 802.11n support for 20 MHz channels provides PHY layer rates up to 72 Mbps.
- Supports a single 2.4 GHz antenna shared between WLAN and Bluetooth.
- Supports standard SDIO v2.0 and gSPI (48 MHz) host interfaces.

Bluetooth

- Complies with Bluetooth Core Specification Version 4.0 + HS with provisions for supporting future specifications.
- Bluetooth Class 1 or Class 2 transmitter operation
- Interface support — Host Controller Interface (HCI) using a high-speed UART interface and PCM for audio data
- Low power consumption improves battery life of handheld devices.

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

Revision History

Document NO: R2-2378SM-DST-01

Version	Revision Date	DCN NO.	Description	Initials	Approved
Version 0. 1	2018/01/18		● Initial Version	N.C. Chen	Chihhao Liao
Version 0. 2	2018/08/08		● WLAN Spec update	JM.Pang	Chihhao Liao
Version 0. 3	2018/10/26		● Block Diagram update	JM.Pang	Chihhao Liao
Version 0. 4	2018/11/02		● Pin Table update	JM.Pang	Chihhao Liao
Version 0. 5	2018/12/21		● RF Spec update ● Update Pin table Voltage to 4.2V	JM.Pang	Chihhao Liao
Version 0. 6	2019/03/05		● Update 1.4.2 WLAN ● Pin Table update	JM.Pang	Chihhao Liao
Version 0. 7	2019/03/20		● Update 1.3 Block Diagram ● Update 2.2 Pin Table ● Modify 3.1 & 3.2 Electrical Characteristics ● Add 3.6 Frequency Reference ● Remove 4.2 PCB Footprint ● Update Specifications 1.4.2 & 1.4.3	JM.Pang	Chihhao Liao
Version 0. 8	2019/04/08		● Update Specifications 1.4.2 & 1.4.3	JM.Pang	Chihhao Liao
A	2019/08/27	DCN015787	● Datasheet format update ● Update Specifications 1.4.3	JM.Pang	Chihhao Liao
B	2020/02/12	DCN016489	● 3.5 Power Consumption Update	JM.Pang	Chihhao Liao
C	2020/03/27	DCN016985	● 1.3.2 WLAN Specifications update ● 1.3.4 Operating Conditions	JM.Pang	Chihhao Liao
D	2021/04/22	DCN021539	● Datasheet format update	JM.Pang	Chihhao Liao

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

AzureWave Technologies, Inc.

Table of Contents

Features **2**
Revision History **3**
Table of Contents **4**
1. Introduction **5**
1.1 Product Overview **5**
1.2 Block Diagram **5**
1.3 Specifications Table **6**
1.3.1 General 6
1.3.2 WLAN 6
1.3.3 Bluetooth 8
1.3.4 Operating Conditions 8
2. Pin Definition **9**
2.1 Pin Map **9**
2.2 Pin Table **10**
3. Electrical Characteristics **13**
3.1 Absolute Maximum Ratings **13**
3.2 Recommended Operating Conditions **13**
3.3 Digital IO Pin DC Characteristics **13**
3.4 Power up Timing Sequence **14**
3.4.1 SDIO Host Interface Specification 14
3.4.2 UART Interface 17
3.4.3 Sequencing of Reset and Regulator Control Signals 19
3.5 Power Consumption **22**
3.5.1 WLAN 22
3.5.2 Bluetooth 22
3.6 Frequency Reference **23**
4. Mechanical Information **24**
4.1 Mechanical Drawing **24**
5. Packaging Information **25**

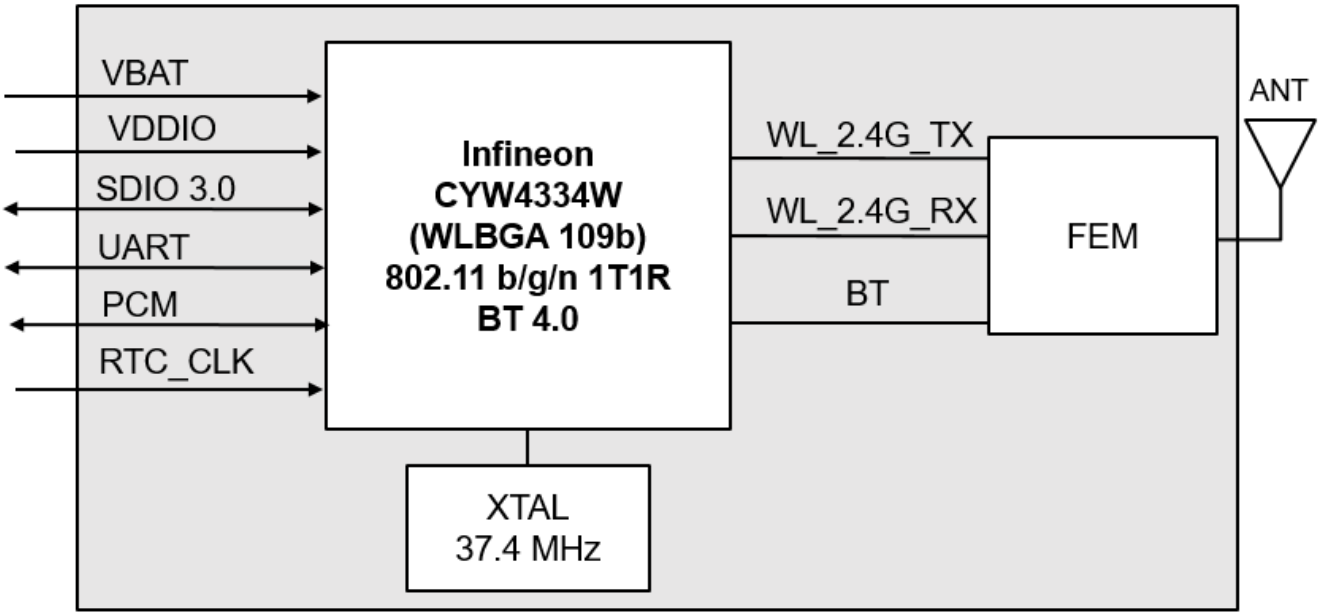
The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

1. Introduction

1.1 Product Overview

AzureWave Technologies, Inc. introduces the pioneer of the IEEE 802.11 b/g/n WIFI with Bluetooth 4.0 combo module provides the highest level of integration for a mobile or handheld wireless system, with integrated IEEE 802.11 b/g and single-stream IEEE 802.11n MAC/baseband/radio, and Bluetooth 4.0. It is designed to be used with external 2.4 GHz front-end modules that include power amplifiers, low-noise amplifiers, and T/R switches.

1.2 Block Diagram



AW-NM378SM BLOCK DIAGRAM

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

1.3 Specifications Table

1.3.1 General

Features	Description
Product Description	IEEE 802.11 b/g/n Wi-Fi compliant/ Bluetooth
Major Chipset	Infineon CYW4334W (109 pins WLBGA)
Host Interface	WiFi + BT ● SDIO + UART
Dimension	12 mm X 12mm x 1.65 mm
Form Factor	Stamp LGA module, 47 pins
Antenna	1T1R, external
Weight	0.4g

1.3.2 WLAN

Features	Description
WLAN Standard	IEEE802.11 b/g/n 1T1R
WLAN VID/PID	N/A
WLAN SVID/SPID	N/A
Frequency Rage	2.4 GHz : 2.412 ~ 2.484 GHz
Modulation	802.11g/n: OFDM 802.11b: CCK(11, 5.5Mbps), DQPSK(2Mbps), BPSK(1Mbps)
Number of Channels	802.11b: USA, Canada and Taiwan – 1 ~ 11 Most European Countries – 1 ~ 13 802.11g: USA and Canada – 1 ~ 11 Most European Countries – 1 ~ 13 802.11n: USA and Canada – 1 ~ 11 Most European Countries – 1 ~ 13
Output Power (Board Level Limit)*	**2.4G**

	Min	Typ	Max	Unit
11b (11Mbps) @EVM<35%	19	21	23	dBm
11g (54Mbps)	18	20	22	dBm

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

<table>
<tr><td></td><td>
<table>
<tr><td>@EVM≦-25 dB</td><td></td><td></td><td></td><td></td></tr>
<tr><td>11n (HT20 MCS7)
@EVM≦-27 dB</td><td>16</td><td>18</td><td>20</td><td>dBm</td></tr>
</table>
</td></tr>
<tr><td>Receiver Sensitivity</td><td>2.4G
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>11b (11Mbps)</td><td></td><td>-90</td><td>-87</td><td>dBm</td></tr>
<tr><td>11g (54Mbps)</td><td></td><td>-77</td><td>-74</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)</td><td></td><td>-75</td><td>-72</td><td>dBm</td></tr>
</table>
</td></tr>
<tr><td>Data Rate</td><td>WLAN:
802.11b : 1, 2, 5.5, 11Mbps
802.11g : 6, 9, 12, 18, 24, 36, 48, 54Mbps
802.11n : up to 72Mbps-single</td></tr>
<tr><td>Security</td><td>● WPA/WPA2 (Wi-Fi Protected Access)
● AES and TKIP in hardware for faster data encryption and IEEE 802.11i compatibility
● Reference WLAN subsystem provides Wi-Fi Protected Setup(WPS)</td></tr>
</table>

* (1) Derate around 1.5 to 2.0 dB when input voltage below 3.8V. If you have any certification questions about output power please contact FAE directly.
* (2) RF performance specified in the data sheet, is guaranteed only for -10C^{o} to +55C^{o}.

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

1.3.3 Bluetooth

Features	Description
Bluetooth Standard	BT4.0
Bluetooth VID/PID	N/A
Frequency Rage	2402MHz~2483MHz
Modulation	Header GFSK Payload 2M: π/4-DQPSK Payload 3M: 8DPSK
Output Power	

	Min	Typ	Max	Unit
BDR	6	8	10	dBm
EDR	-2	0	2	dBm
Low Energy	6	8	10	dBm

Receiver Sensitivity

BT Sensitivity (BER<0.1%)

	Min	Typ	Max	Unit
BDR		-83	-81	dBm
EDR		-78	-76	dBm

1.3.4 Operating Conditions

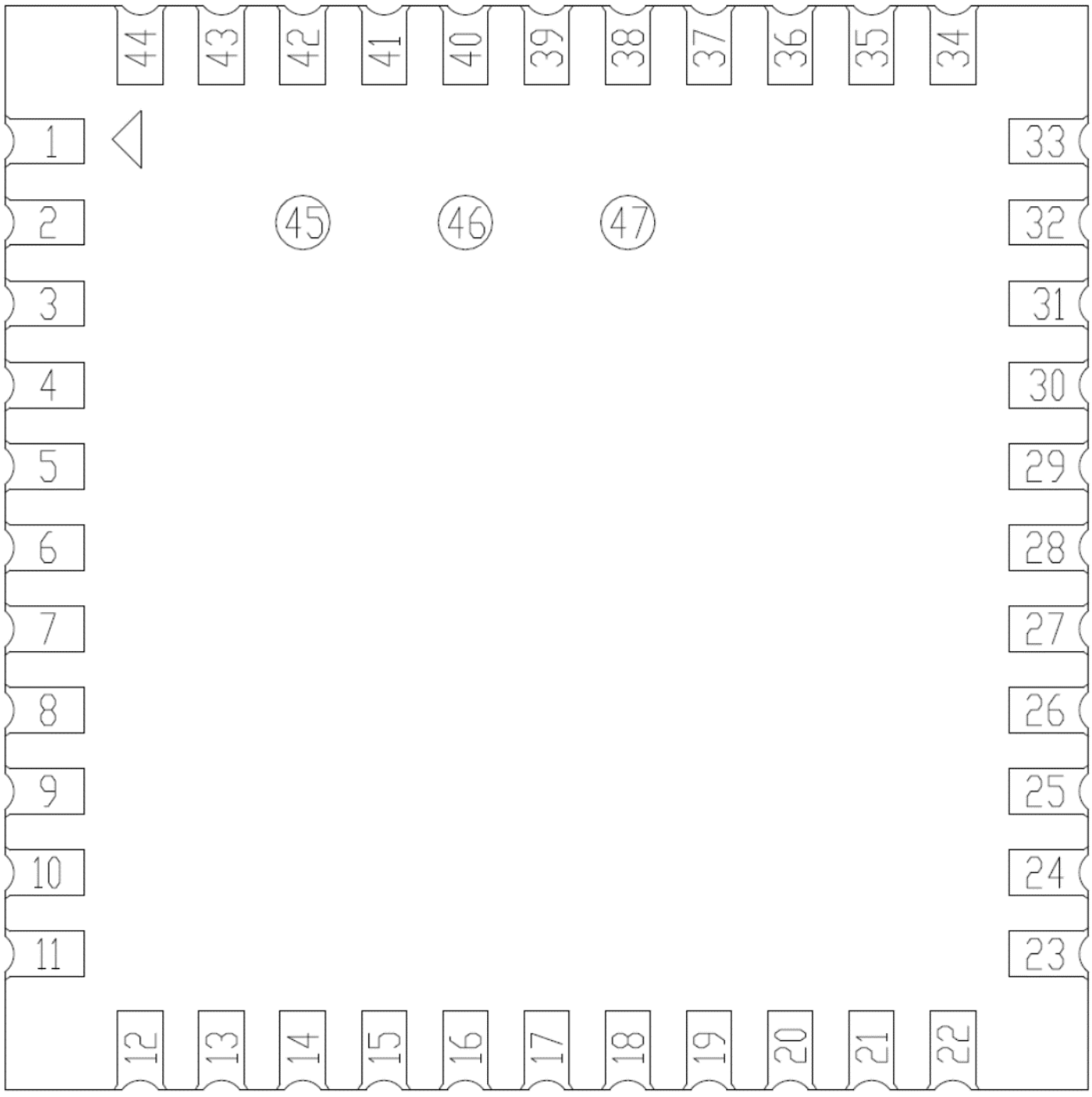
Features	Description
Operating Conditions	
Voltage	Power supply for host:4.2V
Operating Temperature*	-30 ºC to +85 ºC
Operating Humidity	Less than 85%R.H.
Storage Temperature	-40 ºC to +105 ºC
Storage Humidity	Less than 60%R.H.
ESD Protection	
Human Body Model	1KV per MIL-STD-883H Method 3015.8
Changed Device Model	250V per JEDEC EIA/JESD22-C101E

* (1) Functionality is guaranteed but specifications require derating at extreme temperatures.

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

2. Pin Definition

2.1 Pin Map



AW-NM378SM Top View Pin Map

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

2.2 Pin Table

Pin No	Definition	Basic Description	Voltage	Type
1	GND	Ground.		GND
2	WL_BT_ANT	WLAN/BT RF TX/RX path.		RF
3	GND	Ground.		GND
4	NC	Floating Pin		Floating
5	NC	Floating Pin		Floating
6	BT_WAKE	BT Device Wake	VDDIO	I
7	BT_HOST_WAKE	BT Host Wake	VDDIO	O
8	CLK_REQ	Reference clock request	VDDIO	O
9	VBAT	power pin	3~4.8V	VCC
10	NC	Floating Pin		Floating
11	NC	Floating Pin		Floating
12	WL_REG_ON	Used by PMU to power up or power down the internal regulators used by the WLAN section. Also, when deasserted, this pin holds the WLAN section in reset. This pin has an internal 200k ohm pull down resistor that is enabled by default. It can be disabled through programming.	VDDIO	I
13	WL_SDIO_HOST_WAKE	WL Host Wake	VDDIO	O
14	SDIO_DATA2	SDIO Data Line 2	VDDIO	I/O
15	SDIO_DATA3	SDIO Data Line 3	VDDIO	I/O
16	SDIO_CMD	SDIO Command Input	VDDIO	I/O
17	SDIO_CLK	SDIO Clock Input	VDDIO	I
18	SDIO_DATA0	SDIO Data Line 0	VDDIO	I/O
19	SDIO_DATA1	SDIO Data Line 1	VDDIO	I/O
20	GND	Ground.		GND
21	VIN_LDO_OUT	Internal Buck voltage generation pin		VCC

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

22	VDDIO	VDDIO supply for WLAN and BT	1.71~3.63 V	VCC
23	VIN_LDO	Internal Buck voltage generation pin		VCC
24	SUSCLK	External 32K or RTC clock	0.2-3.3V	I
25	BT_PCM_OUT	PCM data Out	VDDIO	O
26	BT_PCM_CLK	PCM Clock	VDDIO	I/O
27	BT_PCM_IN	PCM data Input	VDDIO	I
28	BT_PCM_SYNC	PCM Synchronization control	VDDIO	I/O
29	RF_SW_CTRL4	RF switch control pin	VDDIO	O
30	RF_SW_CTRL5	RF switch control pin	VDDIO	O
31	GND	Ground.		GND
32	NC	Floating Pin		Floating
33	GND	Ground.		GND
34	BT_REG_ON	Used by PMU to power up or power down the internal regulators used by the Bluetooth section. Also, when deasserted, this pin holds the Bluetooth section in reset. This pin has an internal 200kΩ pull down resistor that is enabled by default. It can be disabled through programming.	VDDIO	I
35	NC	Floating Pin		Floating
36	GND	Ground.		GND
37	NC	Floating Pin		Floating
38	NC	Floating Pin		Floating
39	GPIO_2	GPIO configuration pin	VDDIO	I/O
40	GPIO_1	GPIO configuration pin	VDDIO	I/O
41	BT_UART_RTS_N	High-Speed UART RTS	VDDIO	O
42	BT_UART_TXD	High-Speed UART Data Out	VDDIO	O
43	BT_UART_RXD	High-Speed UART Data In	VDDIO	I
44	BT_UART_CTS_N	High-Speed UART CTS	VDDIO	I

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

45	NC	Floating Pin		Floating
46	NC	Floating Pin		Floating
47	NC	Floating Pin		Floating

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VBAT	DC supply for the VBAT and PA driver supply	-0.3	--	+6.0	V
VDDIO	DC supply voltage for digital I/O	-0.5	--	3.90	V
Tj	Maximum junction temperature	--	--	125	˚C

3.2 Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VBAT	Power supply for Internal Regulator and FEM	3.0	--	4.8	V
VDDIO	DC supply voltage for digital I/O	1.71	--	3.63	V

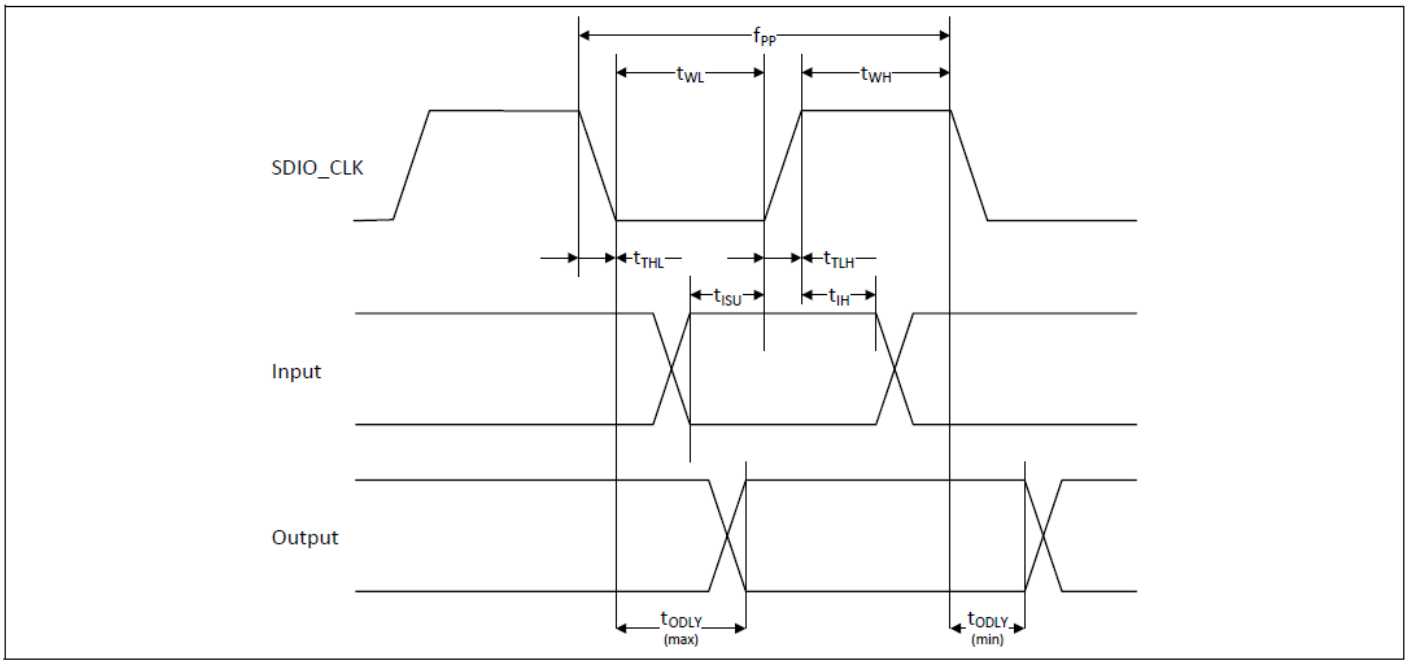
3.3 Digital IO Pin DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Unit
Digital I/O pins, VDDIO=1.8V					
V_{IH}	Input high voltage	0.65 x VDDIO	--	--	V
V_{IL}	Input low voltage	--	--	0.35 x VDDIO	V
V_{OH}	Output High Voltage	VDDIO – 0.45	--	--	V
V_{OL}	Output Low Voltage	--	--	0.45	V
Digital I/O pins, VDDIO=3.3V					
V_{IH}	Input high voltage	2.0	--	--	V
V_{IL}	Input low voltage	--	--	0.8	V
V_{OH}	Output High Voltage	VDDIO – 0.4	--	--	V
V_{OL}	Output Low Voltage	--	--	0.40	V

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3.4 Power up Timing Sequence

3.4.1 SDIO Host Interface Specification



SDIO Bus Timing (Default Mode)

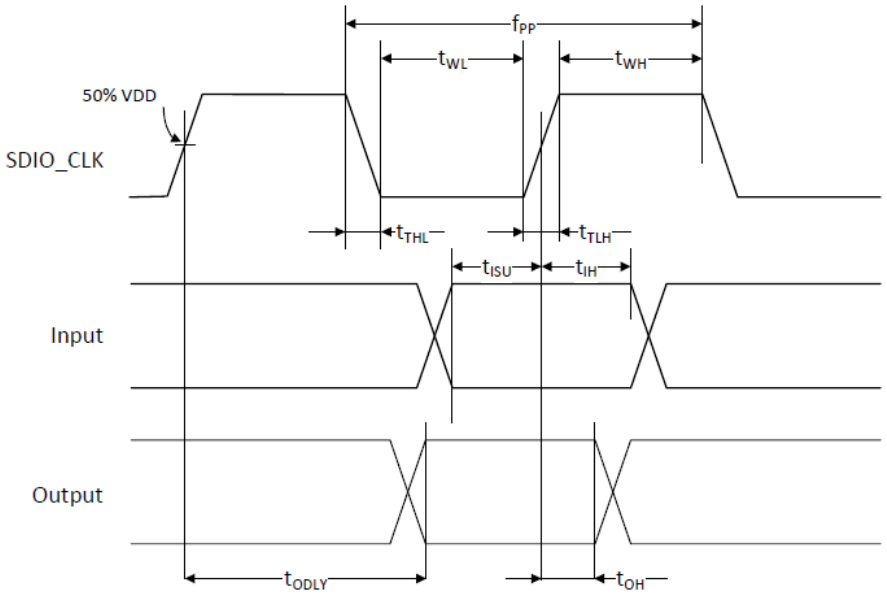
Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (All values are referred to minimum VIH and maximum VILb)					
Frequency – Data Transfer mode	fPP	0	–	25	MHz
Frequency – Identification mode	fOD	0	–	400	kHz
Clock low time	tWL	10	–	–	ns
Clock high time	tWH	10	–	–	ns
Clock rise time	tTLH	–	–	10	ns
Clock low time	tTHL	–	–	10	ns
Inputs: CMD, DAT (referenced to CLK)					
Input setup time	tISU	5	–	–	ns
Input hold time	tIH	5	–	–	ns
Outputs: CMD, DAT (referenced to CLK)					

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

Output delay time – Data Transfer mode	tODLY	0	–	14	ns
Output delay time – Identification mode	tODLY	0	–	50	ns

SDIO Bus Timinga Parameters (Default Mode)

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



SDIO Bus Timing (High-Speed Mode)

Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (all values are referred to minimum VIH and maximum VIL[b])					
Frequency – Data Transfer Mode	fPP	0	–	50	MHz
Frequency – Identification Mode	fOD	0	–	400	kHz
Clock low time	tWL	7	–	–	ns
Clock high time	tWH	7	–	–	ns
Clock rise time	tTLH	–	–	3	ns
Clock low time	tTHL	–	–	3	ns
Inputs: CMD, DAT (referenced to CLK)					
Input setup Time	tISU	6	–	–	ns
Input hold Time	tIH	2	–	–	ns
Outputs: CMD, DAT (referenced to CLK)					
Output delay time – Data Transfer Mode	tODLY	–	–	14	ns
Output hold time	tOH	2.5	–	–	ns
Total system capacitance (each line)	CL	–	–	40	pF

SDIO Bus Timing a Parameters (High-Speed Mode)

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3.4.2 UART Interface

The AW-NM378SM includes a single UART for Bluetooth. The UART is a standard 4-wire interface (RX, TX, RTS, and CTS) with adjustable baud rates from 9600 bps to 4.0 Mbps. The interface features an automatic baud rate detection capability that returns a baud rate selection. Alternatively, the baud rate may be selected through a vendor-specific UART HCI command.
UART has a 1040-byte receive FIFO and a 1040-byte transmit FIFO to support EDR. Access to the FIFOs is conducted through the AHB interface through either DMA or the CPU. The UART supports the Bluetooth 4.0 UART HCI specification: H4, a custom Extended H4, and H5. The default baud rate is 115.2 Kbaud.

The UART supports the 3-wire H5 UART transport, as described in the Bluetooth specification ("Three-wire UART Transport Layer").Compared to H4, the H5 UART transport reduces the number of signal lines required by eliminating the CTS and RTS signals.

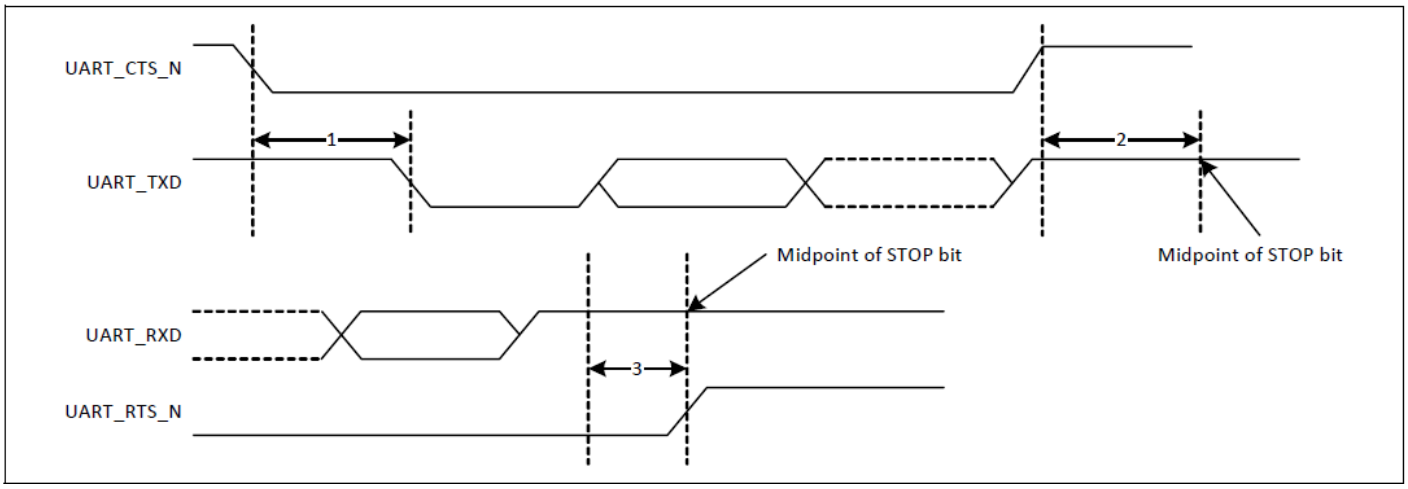
The AW-NM378SM UART can perform XON/XOFF flow control and includes hardware support for the Serial Line Input Protocol (SLIP). It can also perform wake-on activity. For example, activity on the RX or CTS inputs can wake the chip from a sleep state.

Normally, the UART baud rate is set by a configuration record downloaded after device reset, or by automatic baud rate detection, and the host does not need to adjust the baud rate. Support for changing the baud rate during normal HCI UART operation is included through a vendor-specific command that allows the host to adjust the contents of the baud rate registers. The AW-NM378SM UARTs operate correctly with the host UART as long as the combined baud rate error of the two devices is within ±2%.

UART Interface Signals

PIN No.	Name	Description	Type
42	BT_UART_TXD	Bluetooth UART Serial Output. Serial data output for the HCI UART Interface	O
43	BT_UART_RXD	Bluetooth UART Series Input. Serial data input for the HCI UART Interface	I
41	BT_UART_RTS_N	Bluetooth UART Request-to-Send. Active-low request-to-send signal for the HCI UART interface	O
44	BT_UART_CTS_N	Bluetooth UART Clear-to-Send. Active-low clear-to-send signal for the HCI UART interface.	I

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



UART Timing

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	Delay time, BT_UART_CTS_N low to BT_UART_TXD valid	–	–	1.5	Bit periods
2	Setup time, BT_UART_CTS_N high before midpoint of stop bit	–	–	0.5	Bit periods
3	Delay time, midpoint of stop bit to BT_UART_RTS_N high	–	–	0.5	Bit periods

UART Timing Specifications

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3.4.3 Sequencing of Reset and Regulator Control Signals

The AW-NM378SM has three signals that allow the host to control power consumption by enabling or disabling the Bluetooth, WLAN, and internal regulator blocks. These signals are described below. Additionally, diagrams are provided to indicate proper sequencing of the signals for various operational states. The timing values indicated are minimum required values; longer delays are also acceptable.

Description of Control Signals

■ **WL_REG_ON**:

Used by the PMU to power up the WLAN section. It is also OR-gated with the BT_REG_ON input to control the internal AW-NM378SM regulators. When this pin is high, the regulators are enabled and the WLAN section is out of reset. When this pin is low the WLAN section is in reset. If both the BT_REG_ON and WL_REG_ON pins are low, the regulators are disabled.

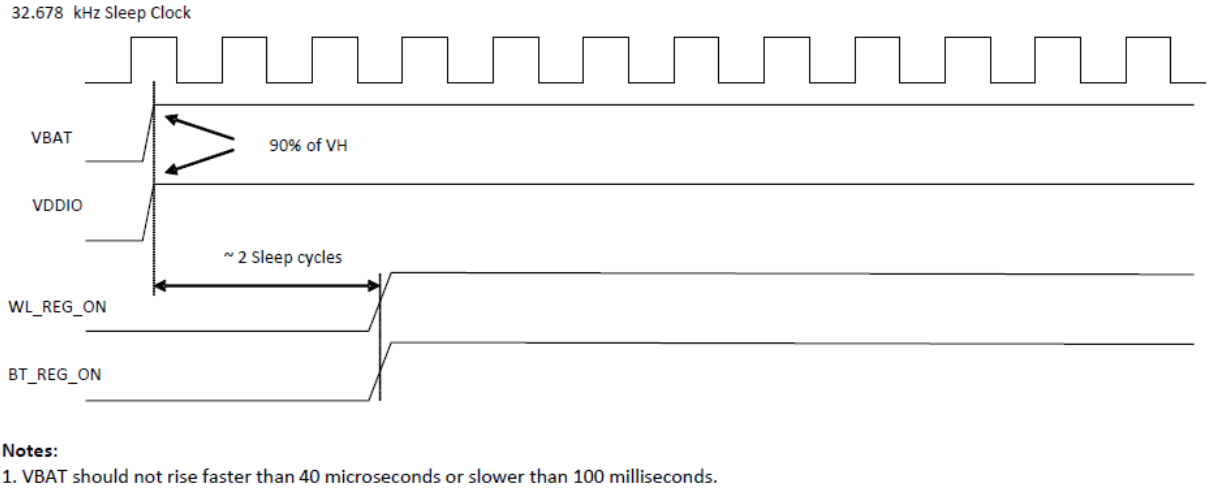
■ **BT_REG_ON**:

Used by the PMU (OR-gated with WL_REG_ON) to power up the internal AW-NM378SM regulators. If both the BT_REG_ON and WL_REG_ON pins are low, the regulators are disabled. When this pin is low and WL_REG_ON is high, the BT section is in reset.

Note:

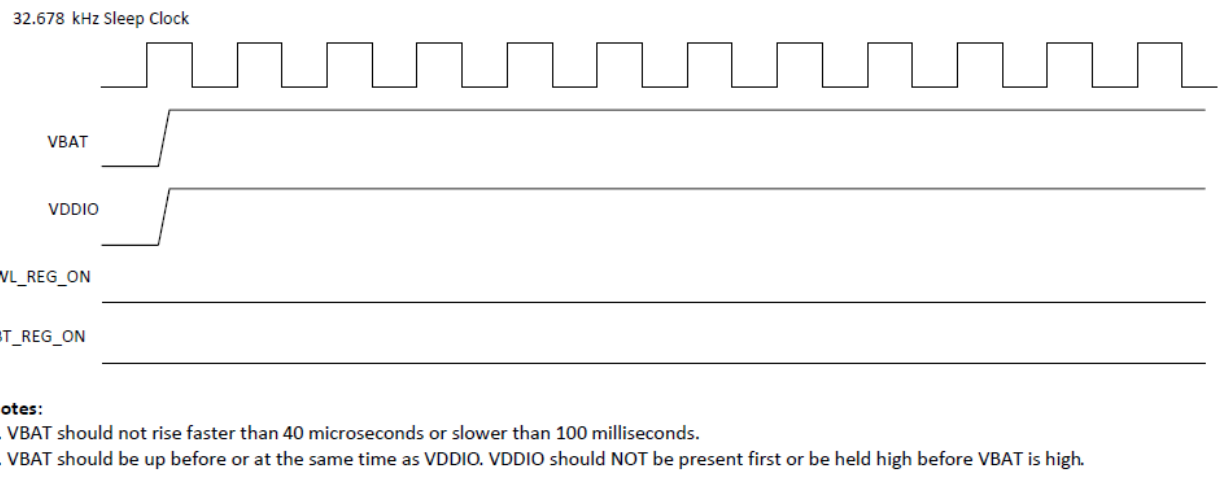
For both the WL_REG_ON and BT_REG_ON pins, there should be at least a 10 msec time delay between consecutive toggles (where both signals have been driven low). This is to allow time for the CBUCK regulator to discharge. If this delay is not followed, then there may be a VDDIO in-rush current on the order of 36 mA during the next PMU cold start.

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



Notes:
1. VBAT should not rise faster than 40 microseconds or slower than 100 milliseconds.
2. VBAT should be up before or at the same time as VDDIO. VDDIO should NOT be present first or be held high before VBAT is high.

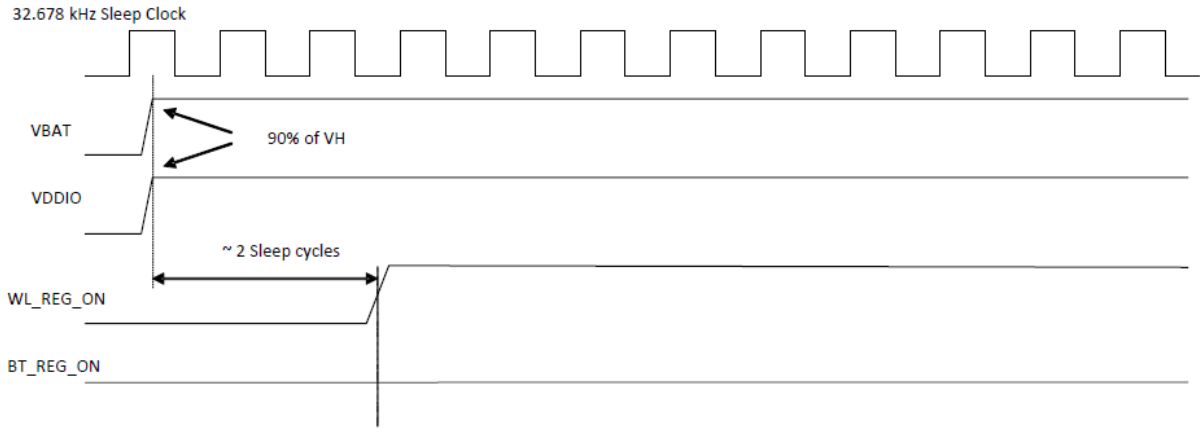
WLAN = ON, Bluetooth = ON



Notes:
1. VBAT should not rise faster than 40 microseconds or slower than 100 milliseconds.
2. VBAT should be up before or at the same time as VDDIO. VDDIO should NOT be present first or be held high before VBAT is high.

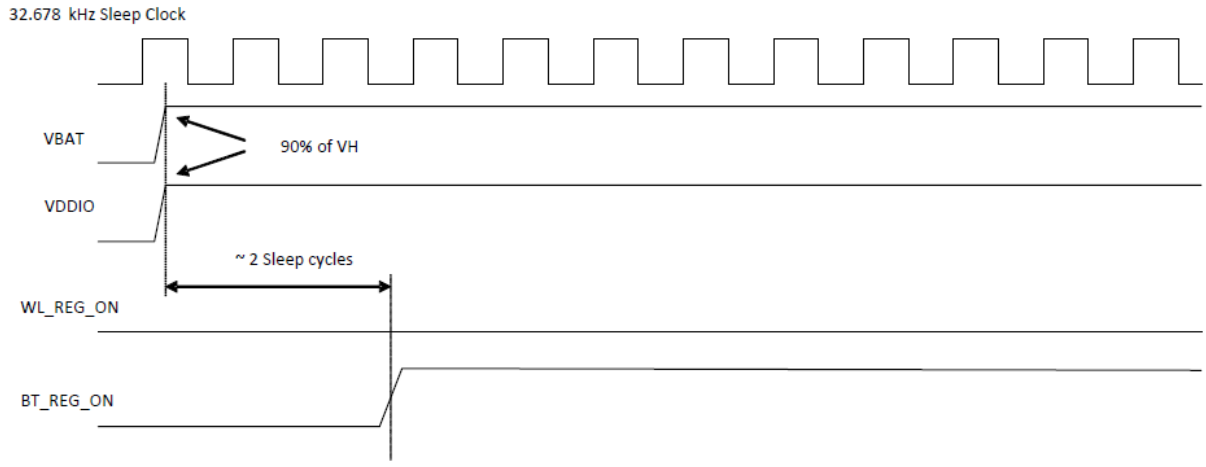
WLAN = OFF, Bluetooth = OFF

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



Notes:
1. VBAT should not rise faster than 40 microseconds or slower than 100 milliseconds.
2. VBAT should be up before or at the same time as VDDIO. VDDIO should NOT be present first or be held high before VBAT is high.

WLAN = ON, Bluetooth = OFF



Notes:
1. VBAT should not rise faster than 40 microseconds or slower than 100 milliseconds.
2. VBAT should be up before or at the same time as VDDIO. VDDIO should NOT be present first or be held high before VBAT is high.

WLAN = OFF, Bluetooth = ON

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3.5 Power Consumption

3.5.1 WLAN

No.	Item			VBAT_IN=4.2 V		
				Max.	Avg.	
1	WLAN OFF *(1)			12.4uA	5.5uA	
2	Sleep *(2)			14.8uA	7.9uA	
3	Power Save DTIM 1 (2.4GHz)*(2) (3)			122.5mA	1.9mA	
4	Power Save DTIM 3 (2.4GHz)*(2) (3)			130.7mA	681uA	
Band (GHz)	Mode	BW (MHz)	RF Power (dBm)	Transmit		
				Max.	Avg.	Duty (%)
2.4	11b@1Mbps	20	21	312.1mA	306.7mA	98.7%
	11g@54Mbps	20	20	205.6mA	188.8mA	63.9%
	11n@MCS7	20	18	169.3mA	160.4mA	62.0%
Band (GHz)	Mode	BW(MHz)		Receive		
				Max.	Avg.	
2.4	11b@1Mbps	20		45.0mA	39.5mA	
	11g@54Mbps	20		45.7mA	42.1mA	
	11n@ MCS7	20		45.2mA	40.2mA	

(1) WLAN and Bluetooth off (WL_SHUTDOWN_N_RST_N=LOW, BT_SHUTDOWN_N=LOW)
(2) Using normal firmware.
(3) Link AP use ASUS RT-AC66U, DTIM = 1, Beacon Interval = 100 ms

3.5.2 Bluetooth

No.	Mode	Packet Type	RF Power (dBm)	VBAT_IN=4.2 V	
				Max.	Avg.
1	Sleep	n/a	n/a	6.27uA	6.24uA
2	Transmit	DH5	7.81dBm	27.9mA	27.7mA
3	Receive	3-DH5	n/a	14.2mA	13.9mA

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3.6 Frequency Reference

The AW-NM378SM uses a secondary low frequency clock for low-power-mode timing. Either the internal low-precision LPO or an external 32.768 kHz precision oscillator is required. The internal LPO frequency range is approximately 33 kHz ± 30% over process, voltage, and temperature, which is adequate for some applications. However, a trade-off caused by this wide LPO tolerance is a small current consumption increase during WLAN power save mode that is incurred by the need to wake up earlier to avoid missing beacons.

Whenever possible, the preferred approach for WLAN is to connect a precision external 32.768 kHz clock to the SUSCLK pin that meets the requirements listed in Table below.

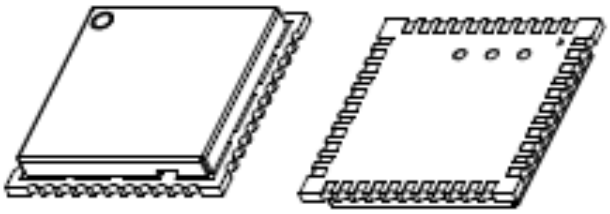
.

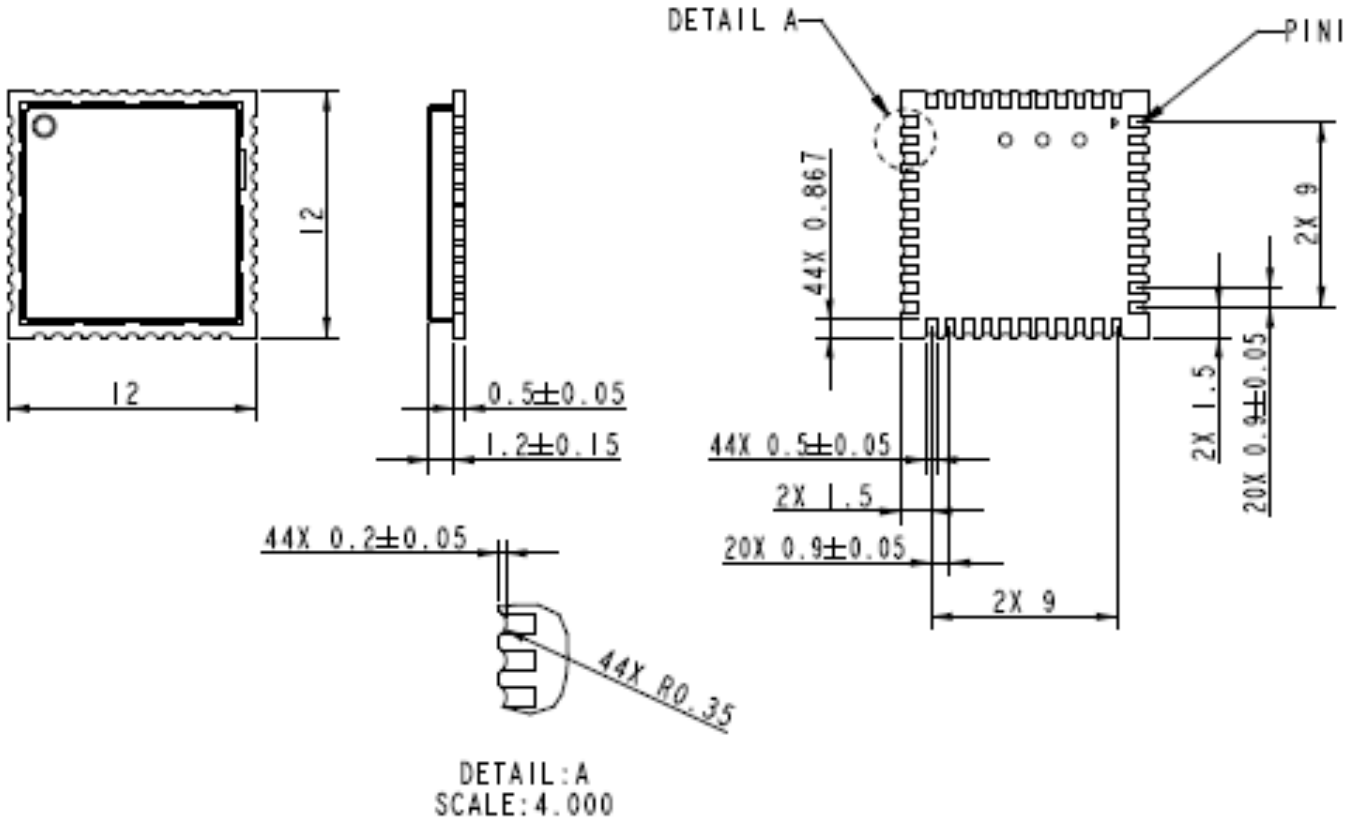
Parameter	SUSCLK(LPO Clock)	Units
Nominal input frequency	32.768	kHz
Frequency accuracy	+-200	ppm
Duty cycle	30 - 70	%
Input signal amplitude	200 - 3300	mV , p-p
Input impedance	>100	kΩ
	<5	pF
Signal type	Square-wave or sine-wave	-
Clock jitter (during initial start-up)	<10000	ppm

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

4. Mechanical Information

4.1 Mechanical Drawing





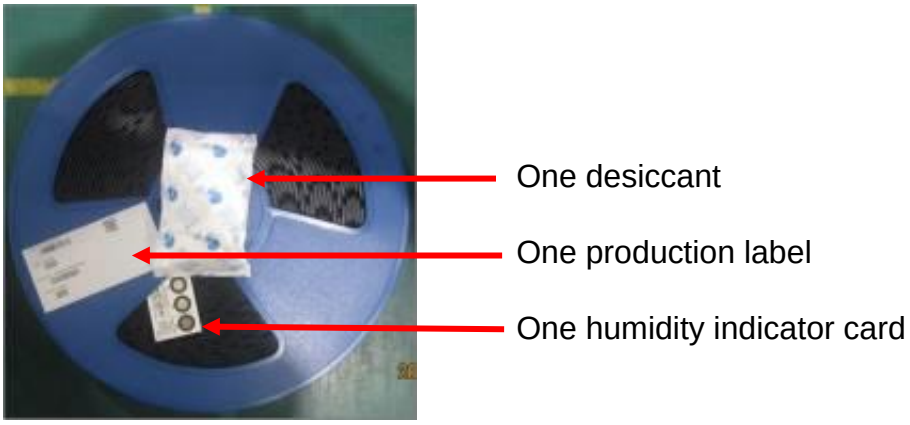
TOLERANCES UNLESS OTHERWISE SPECIFIED:±0.1mm

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

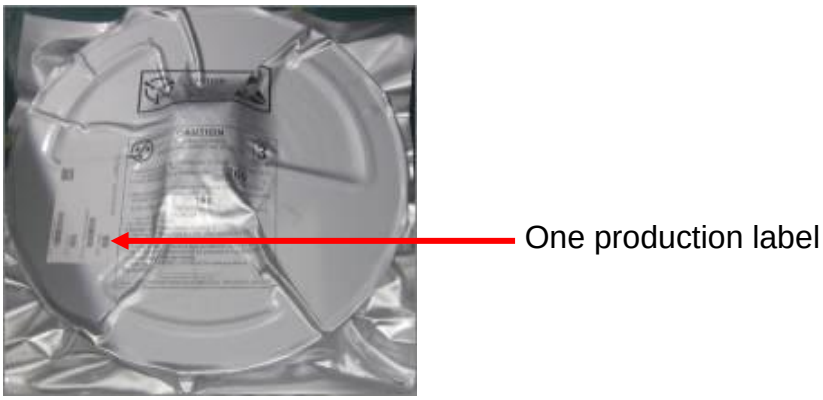
5. Packaging Information

1. One reel can pack 1,500pcs 12x12 stamp modules
   (整軸產品數量為 1500pcs)

2. One production label is pasted on the reel, one desiccant and one humidity indicator card are put on the reel
   (卷軸貼上一張生產標籤，並放上一包防潮包及濕度指示卡)

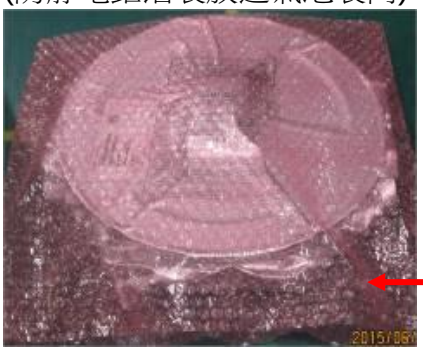


3. One reel is put into the anti-static moisture barrier bag, and then one label is pasted on the bag
   (卷軸放進防靜電鋁箔袋，再貼上一張生產標籤)



The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

4. A bag is put into the anti-static pink bubble wrap
(防靜電鋁箔袋放進氣泡袋內)



One anti-static pink bubble wrap

5. A bubble wrap is put into the inner box and then one label is pasted on the inner box
(氣泡袋放進內箱中，再貼上一張生產標籤)

One production label

6. **5 inner boxes** could be put into one carton
(五個內箱可以放進一個外箱)

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

7. Sealing the carton by AzureWave tape

   (使用海華 Logo 膠帶將外箱進行工字型封箱)

8. One carton label and one box label are pasted on the carton. If one carton is not full, one balance label pasted on the carton

   (外箱上貼附出貨標籤和箱號標籤；如不滿箱，需貼附尾數標籤)

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.